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ABSTRACT

Following a list of objectives for secondary school science for Alberta (Canada), science objectives for grade 7 (biological sciences), grade 8 (earth science), and grade 9 (physical science) are presented in three separate sections. These objectives are related to key concepts listed in the table of contents. The format of each section is the same. Concepts, subconcepts, objectives, and suggested time (in weeks) are presented in table form. Objectives are keyed, when applicable, to specific textbooks and/or audiovisual materials. Both content and process objectives are emphasized. (JN)

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OBJECTIVES

Junior High School

Science

COMPILED AND EDITED BY:
MERVYN A. LYNCH

EDMONTON CATHOLIC SCHOOLS
1980

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Preface

1. Purpose

At Zone meetings toward the end of school year 1975-76, several teachers expressed a desire to have objectives for the various junior high school science courses. This desire arose partly, one suspects, due to the fact that 78 per cent of our junior high school science teachers are the only science teachers in their school. There is no opportunity to share ideas on what depth or shallowness to treat a given concept. The hope is these objectives will fill the void.

2. Structure of the booklet

The booklet is deliberately sub-titled first edition. It is possible, in spite of the extensive feedback obtained, that there are too many objectives for some concepts. Too many objectives can become no objectives. These objectives will be reviewed in two or three years.

Concepts and sub-concepts are taken from Alberta Education Junior High School Curriculum Guide 1978.

At the end of each set of objectives are suggested time in weeks. These times are merely suggestions. The concepts and hence the objectives may be taught in any order.

3. Time Factor

In theory, there should be ample time to teach these core objectives. The remaining weeks are to be spent on an elective topic.

4. References

Textbook references are those prescribed by Alberta Education.

Grade 7

Carter, J.L. et al. Life Science: A Problem Solving Approach.

Smallwood, W.L. Challenges to Science: Life Science.

Grade 8

Heller, R.L. et al. Challenges to Science: Earth Science.

Jackson, J.H. and E.D. Evans. Spaceship Earth: Earth Science.

Grade 9

Bickel, C.L. et al. Physical Science Investigations.

Carter, J.L. et al. Physical Science: A Problem Solving Approach.

Heath, R.W. and R.R. McNaughton. Physical Science: Interaction of Matter and Energy.

Townsend, R.D. and P. DeH. Hurd. Energy, Matter and Change.

Teachers are, nevertheless, free to develop the activities or procedures from any source they see fit. This is particularly so, for those schools with the Curriculum Resources Information Bank (CRIB).

Audio-Visual references are to 16 mm film. A number of schools have built or are building their own film-strip library. Perhaps the better of these titles will be circulated at some future date.

Objectives of Secondary School Science for Alberta[1]

The learning of science as an area of human endeavor should provide the student with a scientific literacy which enables him to assume an active and useful role as a citizen in a democratic society. It may be assumed that this literacy is best achieved by considering the individual needs of students and through independent study and learning.

The objectives of Secondary School Science are:

1. To promote an understanding of the role that science has had in the development of societies:

   a) history and philosophy of science as part of human history and philosophy
   b) interaction of science and technology
   c) effect of science on health, population growth and distribution, development of resources, communication and transportation, etc.

2. To promote an awareness of the humanistic implications of science:

   a) moral and ethical problems in the use and misuse of science
   b) science for leisure-time activities

3. To develop a critical understanding of these current social problems which have a significant scientific component in terms of their cause and/or their solution:

   a) depletion of natural resources
   b) pollution of water and air
   c) overpopulation
   d) improper use of chemicals
   e) science for the consumer

4. To promote understanding of and development of skill in the methods used by scientists:

   a) processes in scientific inquiry such as observing, hypothesizing, classifying, experimenting and interpreting data
   b) intellectual abilities such as intuition, rational thinking, creativity, and critical thinking
   c) skills such as manipulation of materials, communication, solving problems in groups, and leadership

5. To promote assimilation of scientific knowledge:

a) emphasis on fundamental ideas
b) relevance of scientnfic knowledge through inclusion of practical applications
c) application of mathematics in science
d) interrelationships between the sciences
e) open-endedness of science and the tentativeness of scientific knowledge

6. To develop attitudes, interests, values, appreciations, and adjustments similar to those exhibited by scientists at work.

7. To contribute to the development of vocational knowledge and skill:

a) science as a vocation
b) science as background to technical, professional and other vocations

[1]Reprinted from Curriculum Guide - 1978 Junior High School Science

General Objectives - Grade 7 Science

(Reprinted from Junior High School Science Program of Studies

Alberta Education 1978)

After participating in the activities and completing the assignments associated with this course, the student should be able to:

7.1 Demonstrate a knowledge of and be able to discuss the identified major concepts and their subconcepts within the context of a study of life science. These major concepts are:

- 7.1.1 All sets of objects including living things may be classified into groups having common characteristics.
- 7.1.2 Cells are the unit of structure and function of most living things.
- 7.1.3 Living things carry on certain fundamental processes to sustain and perpetuate life.
- 7.1.4 All living things interact with and are interdependent upon each other and their environment.

7.2 Acquire such investigative skills associated with science as:

- Observing with all the senses
- Classifying related objects or ideas
- Quantifying measured data
- Manipulating data to identify the patterns
- Identifying problems clearly so that the variables may be controlled or manipulated
- Interpreting data, making inferences leading to hypotheses and predicting future behavior.

7.3 Identify and discuss the limitations of experimental data in terms of the underlying assumptions and the identified problem.

7.4 Assume a responsibility for keeping the workspace neat and tidy by practicing safe, and careful, work habits.

7.5 Recognize and be able to cite examples of the contributions made by such historical figures as Robert Hooke, Louis Pasteur.

7.6 Investigate factors related to the wise use of renewable resources and man's impact upon the environment.

		REFERENCES		
		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.1	All sets of objects, including living things may be classified into groups having common characteristics.			
SUB - CONCEPT:	1. Classification makes thinking about a larger number of things simpler and easier. a) Within larger groups, members share common characteristics, within smaller sub-groups, members share a greater number of common characteristics.			
OBJECTIVES:	The student will be able			
	1. To identify similarities and differences in observable characteristics of objects.	p. 42f		
	2. To group objects according to observable similarities.	p. 48		
	3. To group or categorize objects by a variety of criteria.	p. 48		
	4. To organize larger groups of objects, with common characteristics, into sub-groups.	p. 45		
SUGGESTED TIME IN WEEKS:	0.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.1	All sets of objects, including living things may be classified into groups having common characteristics.			
SUB - CONCEPT:	1. Classification makes thinking about a large number of things simpler and easier. b) Living things may be classified as protist, plant, or animal.			
OBJECTIVES:	The student will be able to state			
	1. That organisms may be grouped according to a variety of classification schemes.	p. 54		Introducing Insects-Butterflies, Beetles and Bugs: 8C 111E (I.M.C.)
	2. That in the life sciences, taxonomies of organisms are used to name and classify organisms according to structural characteristics.	p. 55		
	3. That the major categories in a taxonomy of organisms are called kingdoms and are sub-divided into phyla.	p. 57	p. 276	Mammals are Interesting: 8C 208E (I.M.C.)
	4. That most biological taxonomies now include at least three kingdoms: plants, animals, protists.	p. 125 f	pp. 292, 428-429 325-400, 442-446, 276-278	What is a fish 12C76E What is a repitle 8C27E Angiosperms 12C22E
SUGGESTED TIME IN WEEKS:	1			

		REFERENCES		
		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.2	Cells are the unit structure and function of most living things.			
SUB - CONCEPT:	1. The techniques and tools of scientists aid in observing things. (e.g. microscopes)			
OBJECTIVES:	The student will be be able			
	1. To identify the main parts of a microscope.	p. 74		
	2. To effectively use and care for a microscope.	p. 72 f		
	3. To focus clearly on a prepared slide using low, medium and high power objective lens.	p. 76 f		
	4. To compare the magnification of three objectives using a prepared slide.	p. 81	pp. 66-68 (also how to prepare slides)	
	5. To manipulate a slide on a microscope stage.	p. 78 f		
	6. To measure the field view of a microscope.	p. 80 f		
SUGGESTED TIME IN WEEKS:	1			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.2	Cells are the basic structure and function of most living things.			
SUB - CONCEPT:	2. Plant and animal cells share many common characteristics.			
OBJECTIVES:	The student will be able			
	1. To describe Robert Hooke's discovery of cells.	p. 88	p. 60	
	2. To prepare a simple stained slide of cheek cells and onion tissues and observe under the microscope.	pp. 94-98	pp. 64-66	
	3. To state the cell theory.	p. 89	p. 60	
	4. To describe the basic structure of plant and animal cells.	p. 92	pp. 62-69; 71-78	Cells and What They Do: 4C 530 E (I.M.C.)
SUGGESTED TIME IN WEEKS:	2			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.2	Cells are the unit of structure and function of most living things.			
SUB - CONCEPT:	3. Cells live independently or in groups. a) Single celled organisms perform all the functions necessary for life.			
OBJECTIVES:	The student will be able			
	1. To observe and describe the parts of three-single celled organisms.	p. 137	pp. 69-70, 279, 285, 286	Amoeba 4B231E (I.M.C.)
	2. To state the processes by which substances move into, out and among cells.		pp. 71-79	
	3. To state the parts and functions of the nucleus.	p. 108, 127		
	4. To describe simple cell division.		p. 70; pp. pp. 139-142	
SUGGESTED TIME IN WEEKS:	3			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.2	Cells are the unit of structure and function of most living things.			
SUB - CONCEPT:	3. Cells live independently or in groups. b) Some cells in multi-cellular organisms are specialized to carry out specific functions.			
OBJECTIVES:	The student will be able			
	1. To state the meaning of tissue, organ, system.	p. 109 f	pp. 81 - 98	Man: The Incredible Machine 12C 220E (I.M.C.)
	2. To identify the major compounds and elements which make up the human body.		pp. 97 - 118	
	3. To classify the various tissues of the human body into five groups.			
SUGGESTED TIME IN WEEKS:	1			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	1. Organisms require nutrients for energy. a) Green plants use the sun's energy to produce food.			
OBJECTIVES:	The student will be able			
	1. To identify the parts of a plant involved in photosynthesis.		pp. 43-44; 58-62	
	2. To state the function of each part of a green plant involved in photosynthesis.	p. 113		
	3. To name and identify some of the major materials needed for photosynthesis.	pp. 113 - 114	pp. 43 - 44	Photosynthesis (2nd Ed.):
	4. To state that photosynthesis is a chemical process whereby cells use the energy of sunlight to produce oxygen and food.	p. 114		12C 233 E (I.M.C.)
SUGGESTED TIME IN WEEKS:	2.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	1. Organisms require nutrients for energy. b) Energy from stored food is usable when organisms breakdown food into nutrients. - some basic foods are starch, sugar, protein, fats and oils.			
OBJECTIVES:	The student will be able			
	1. To differentiate between food and nutrients.	p. 366	p. 46	Foods and Nutrition:
	2. To name and classify the seven basic nutrients.	p. 367f, 373		482E (I.M.C.)
	3. To perform the chemical tests for glucose, starches, proteins, fats and oils.	p. 368 f		
	4. To identify the foods containing starches, proteins, fats.	p. 370		
	5. To recognize the importance of minerals and water in the dirt.	p. 373		
	6. To list five common vitamins necessary for health and the consequences of vitamin deficiency.	p. 373 f	pp. 204-205	
	7. To demonstrate and describe the effect of heat on starches, or proteins.			
SUGGESTED TIME IN WEEKS:	2.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	1. Organisms require nutrients for energy. c) All living things obtain their energy from respiration. - Organisms obtain oxygen from their environment in a variety of ways. - Oxygen enables organisms to burn food for energy.			
OBJECTIVES:	The student will be able			
	1. To name and locate the organs of the human respiratory system.	(very rudimentary) p. 327		
	2. To state the function of the respiratory organ.		p. 106 (human)	
	3. To describe how man and one other organism obtain oxygen from the environment.		p. 106-108 (human)	
	4. To describe how man and one other organism release carbon dioxide to the environment.		p. 106-108 (human)	
	5. To define respiration in terms of oxidation of foods.			
SUGGESTED TIME IN WEEKS:	1			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	1. Organisms require nutrients for energy. d) Food products and gases must be available to all cells throughout an organism. - Cells receive nourishment and eliminate waste through the process of diffusion. - More complex organisms show a need for specialized circulatory systems.			
OBJECTIVES:	The student will be able to			
	1. Distinguish between osmosis and diffusion.	pp. 235-248	not mentioned	Diffusion and Osmosis:
	2. Demonstrate the process of osmosis in the laboratory.	pp. 242-246		
	3. Demonstrate the process of diffusion in the laboratory.	pp. 236-241		8C 506E (I.M.C.)
	4. Infer that food products, gases and water pass in and out of body cells.			
	5. To name and locate organs of the human circulatory system.	p. 110	pp. 110-117	The Heart and the Circulatory System
	6. To state the function of the organs of the circulatory system.	p. 117	p. 110	8C 508E (I.M.C.)
SUGGESTED TIME IN WEEKS:				
	cont.....			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	1. Organisms require nutrients for energy. d) Food products and gases must be available to all cells throughout an organism. - Cells receive nourishment and eliminate waste through the process of diffusion. - More complex organisms how a need for specialized circulatory systems. (continued from previous page)			
OBJECTIVES:	The student will be able (continued from previous page)			
	7. To name and locate parts of the human heart.	p. 329	p. 110	
	8. To describe the flow of blood through the human body.	pp. 318-319	pp. 110-117	Hemo-The Magnificent U.of A. Dept. of Ext.
	9. To name the various parts of blood.	p. 118	pp. 110-111	
	10. To list the function of red and white corpuscles.			
	11. To list the function of plasma.			
SUGGESTED TIME IN WEEKS:	3.0 Schools with Health in their program may wish to spend less time.			Work of the Blood 88 7E (I.M.C.)

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	2. Energy enables organisms to carry out activities in order to sustain life.			
	a) Organisms obtain nutrients in a variety of ways.			
	The student will be able			
OBJECTIVES:	1. To describe three methods used by organisms to obtain nutrients.	p. 316		
	2. To name and locate the organs of the human digestive system.	p. 316f, 327	p. 105	Digestion of Foods: 488E (I.M.C.)
	3. To state the function of each digestive organ.	p. 333	pp. 100-105	Digestive System: 8C 191E
	4. To differentiate between mechanical and chemical digestion.	p. 333	pp. 99-100	
	5. To describe the chemical digestion of carbohydrates, fats and proteins.			
	6. To recognize the role of digestive enzymes in the digestive process.	p. 333	pp. 100-101	
	7. To describe the absorption of nutrients from the small intestine into the blood system.	p. 318f		
SUGGESTED TIME IN WEEKS	1.5			

		REFERENCES		
		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	2. Energy enables organisms to carry out activities in order to sustain life. b) Growth of an organism may result in change in structure or proportion, or an increase in size.			
OBJECTIVES:	The student will be able			
	1. To recognize what is meant by growth in a living organism.	p. 192f	pp. 141; 179-180	8C 560 E Food and Growth
	2. To describe the processes by which growth takes place.	p. 211f	pp. 180-185	
SUGGESTED TIME IN WEEKS:	0.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	2. Energy enables organisms to carry out activities in order to sustain life. c) Organisms react to their internal and external environment. - Different species may have different ways of receiving and responding to stimuli. - Organisms differ in their adaptation to the environment.			
OBJECTIVES:	The student will be able 1. To describe the various ways different organisms respond to stimuli. 2. To deduce that response to stimulus is essential to survival.	p. 211f p. 212	Treated indirectly on pp. 128-137	Animals See In Many Ways: 8C 602E (I.M.C.)
SUGGESTED TIME IN WEEKS:	1.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.3	Living things require energy to carry on certain fundamental processes in order to sustain life.			
SUB - CONCEPT:	2. Energy enables organisms to carry out activities in order to sustain life.			
	d) Organisms must reproduce to ensure survival of the species.			
	- Organisms may reproduce sexually, asexually, or by both means.			
	- An offspring inherits certain characteristics from its parents.			
	- There are many variations within a population.			
OBJECTIVES:	The student is able to state			
	1. That asexual reproduction is the process by which one cell or a group of cells from an organism develops into another organism.		p. 143	
	2. That sexual reproduction results after two cells unite. These cells come from different parents.		pp. 145-147	
	3. That certain organisms reproduce both sexually and asexually.		pp. 332-335	
	4. That certain characteristics are passed on to the offspring during the reproductive process.		pp. 146-147 pp. 161-162, 167	
	5. That sexual reproduction accounts for a wide variety of individuals in a given population.		pp. 170-175, 204 pp. 147, 167-169	
SUGGESTED TIME IN WEEKS:	3.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.4	All living things interact with and are interdependent with each other and their environment.			
SUB - CONCEPT:	1. Life on our planet is possible in the ecosphere.			
	a) Living and non-living things interact within ecosystems.			
OBJECTIVES:	The student will be able			
	1. To give a definition of ecosystem.		pp. 39-40	
	2. To list three factors in the environment that affect living things.	p. 355	p. 47	
	3. To distinguish between producers and consumers.	pp. 355-356	pp. 43-46	
	4. To give a definition of ecosphere.		p. 43	
SUGGESTED TIME IN WEEKS:	1.0			

		REFERENCES		
		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.4	All living things interact with and are interdependent with each other and their environment.			
SUB - CONCEPT:	1. Life on our planet is possible in the ecosphere. b) Communities of organisms exist within the ecosystem.			
	The student will be able			
OBJECTIVES:	1. To define population.	p. 341 p. 354	pp. 4-13, 18-35, 47-54, 93	See pages vii & viii of I.M.C. Resource Materials available for Junior High Science
	2. To define community.			
	3. To explain some causes of changes in a population.	p. 362	pp. 146-147, 158-159, 167-169, 246	
	4. To estimate the size of a population using sampling techniques.	p. 355		
	5. To describe population dispersal.		pp. 30-32, 36-37	
	6. To describe an ecological succession in a given area.			
	7. To suggest reasons for migration of certain species on an annual basis.			
SUGGESTED TIME IN WEEKS:	1			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.4	All living things interact with and are interdependent with each other and their environment.			
SUB - CONCEPT:	2. The members of each community show adaptation which are necessary for survival in the community. a) Some organisms are specific to certain communities (distribution).			
OBJECTIVES:	The student will be able 1. To list four factors that determine the nature of a terrestrial ecosystem. 2. To determine parts of soil that are important for plant nutrient. 3. To name the major terrestrial ecosystems. 4. To deduce how plant and animal life is suited to a particular terrestrial ecosystem.		pp. 435-437 pp. 438-439 pp. 439-448	See pages vii & viii of I.M.C. Resource Materials available for Junior High Science
SUGGESTED TIME IN WEEKS:	1.5			

cont.....

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.4	All living things interact with and are interdependent with each other and their environment.			
SUB - CONCEPT:	2. The members of each community show adaptation which are necessary for survival in the community. a) Some organisms are specific to certain communities (distribution). (continued from previous page)			
OBJECTIVES:	The student will be able (continued from previous page)			
	5. To list the main characteristics of the temperate grassland ecosystem.		p. 443	The Ultimate Forest 16C 17E (I.M.C.)
	6. To list the main charactertistics of the temperate deciduous forest ecosystem.		p. 444	
SUGGESTED TIME IN WEEKS:	1.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.4	All living things interact with and are interdependent with each other and their environment.			
SUB - CONCEPT:	2. The members of each community show adaptations are necessary for survival in the community. b) Some organisms may exist in more than one community (tolerance).			
OBJECTIVES:	The student will be able 1. To define tolerance as the ability to withstand environmental conditions. 2. To recognize that tolerance can vary among individuals.			
SUGGESTED TIME IN WEEKS:	0.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.4	All living things interact with and are interdependent with each other and their environment.			
SUB - CONCEPT:	3. An organism is the product of both heredity and environment.			
OBJECTIVES:	The student will be able			
	1. To state that heredity units, genes, are passed on in the reproductive process.	p. 344	p. 146	
	2. To describe how environmental factors effect an organism.	pp. 339-340	pp. 146-147	Adaptive Radiation - the mollusks 8B-28-E (I.M.C.)
	3. That certain chracteristics are passed on to the offspring during the reproductive process.		pp. 161-162, 167, 170-175, 20A	How nature protects Animals 4B 225E (I.M.C.)
	4. That sexual reproduction accounts for a wide variety of individuals in a given population.	p. 344	pp. 147, 167	
SUGGESTED TIME IN WEEKS:	1.5			

		REFERENCES		
		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.4	All living things interact with and are interdependent with each other and their environment.			
SUB - CONCEPT:	4. The environment and the distribution of organisms are in a state of continual change. a) Nature constantly re-cycles materials.			
OBJECTIVES:	The student will be able			
	1. To recognize the role of water in the terrestrial ecosystem.		pp. 435-436	
	2. To recognize the role of temperature in the environment.		p. 436	
SUGGESTED TIME IN WEEKS:	0.5			

REFERENCES

		Carter et al	Smallwood	Audio-Visual
CONCEPT: 7.4	All living things interact with and are interdependent with each other and their environment.			
SUB - CONCEPT:	4. The environment and the distributions of organisms are in a state of continual change. b) Changes may take place over an extended period of time.			
OBJECTIVES:	The student will be able			
	1. To construct and analyze a food web.		p. 51	See pages vii & viii of I.M.C. Resource Materials available for Junior High Science
	2. To define niche, habitat diversity.		pp. 21, 23, 31	
	3. To recognize ways in which organisms solve the problem of competition by being adaptable.		pp. 23-24	
	4. To describe the environmental conditions that are the major determinants of types of organisms that can survive in particular environments.		pp. 26-35	
SUGGESTED TIME IN WEEKS:	1.5			

ELECTIVE TOPICS

Elective topics are to be chosen from the following list. A minimum of one topic is to be studied.

Outlines for each elective will be forwarded to teachers when available.

7.1 Mankind's influence may increase the rate of change with beneficial or harmful results to the environment.

7.2 Man commands the use of a great supply of energy to change the environment to his liking.

7.3 Pollution due to man's production and use of energy can be minimized.

7.4 The preservation of man's biological resources depends on an awareness and the positive action of each individual.

7.5 A simple key may be used to facilitate identification of organisms.

7.6 A locally developed unit.

General Objectives - Grade 8 Science

(Reprinted from Junior High School Science Program of Studies - Alberta Education 1978)

Objectives: After participating in the activities and completing the assignments associated with the course, the student should be able to:

8.1 Demonstrate a knowledge of and be able to discuss the identified major concepts and their associated subconcepts within the context of a study of the earth. These major concepts are:

- 8.1.1 A perspective of the position and motion of the Earth in space is gained by celestial observations and measurements.
- 8.1.2 Various theories attempt to explain the origin of the solar system and the universe.
- 8.1.3 The Sun is a typical star.
- 8.1.4 Solar gravity and planetary inertia maintain a system of planets in orbit.
- 8.1.5 The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.
- 8.1.6 Local conditions in the atmosphere are referred to as weather.
- 8.1.7 The crust of the Earth is formed of rocks.
- 8.1.8 The crust of the Earth is constantly being changed.

8.2 Demonstrate increasing competence in the investigative skills associated with science:
- Observing with all of the senses
- Manipulating technical instruments
- Collecting reliable data
- Manipulating the data to identify any patterns
- Interpreting data, making inferences leading to hypotheses, and predicting future behavior.

8.3 Participate in a study of some local phenomenon such as the weather patterns over a period of time, collect the data and relate these to the regional patterns and the long-term climatic conditions.

8.4 Recognize and be able to cite the contributions to modern theories of such scientists as Galileo, Kepler, Hutton and Wegener.

8.5 Examine topics of current scientific interest in an objective and open-minded manner.

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.1	A perspective of the position and motion of the Earth in Space is gained by celestial observation and measurements.			
SUB CONCEPT:	1. Through history, man has searched for a systematic way of orientating himself and explaining his observations.			
OBJECTIVES:	The student will be able:			
	1. To describe two astronomical concepts generated by various ancient civilizations.			
	2. To describe the basic Ptolemaic model.		p. 103	
	3. To describe the basic Copernican model.		p. 103	
SUGGESTED TIME IN WEEKS:	.5			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.1	A perspective of the position and motion of Earth in space is gained by celestial observation and measurements.			
SUB CONCEPT:	2. The motions of the Earth with respect to its neighbors, have a profound effect on man.			
OBJECTIVES:	The student will be able:			
	1. To state that the Earth-Moon is referred to as a double planet.		p. 136	8B 236 E "A Trip To The Moon" (IMC)
	2. To deduce that the moon rotates once as it revolves around the Earth.		pp. 130-132	
	3. To describe the phases of the moon.	pp. 312-314	pp. 130-133	8C 495 E "The Stars through the seasons"
	4. To describe that gravitational attraction between the Earth and Sun that causes tides on Earth.	pp. 312, 316-318	pp. 141-143	4B 38 E "The Moon" (IMC)
	5. To explain the formation of lunar and solar eclipses. (cont.)	pp. 314-315	pp. 131-132	4B 66E "Space Probes. Exploring Our Solar System" (IMC) Moon, The. A Giant Step in Geology 12C-242-E

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.1	A perspective of the position and motion of Earth in space is gained by celestial observation and measurements.			
SUB CONCEPT:	2. The motions of the Earth with respect to its neighbors, have a profound effect on man.			
OBJECTIVES:	cont. from previous page			
	6. To build a model of the solar system.		p. 94-95	8C 237 E "A Trip To the Planets" (I.M.C.)
	7. To observe that planets are wanderers in the sky.		pp. 101-105	
	NOTE: Students should realize the limit of models.			
SUGGESTED TIME IN WEEKS:	2.0			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.1	A perspective of the position and motion of the Earth in Space is gained by celestial observation and measurements.			
SUB CONCEPT:	3. The many tools and technologies used by Earth-Space scientists help develop explanations of the universe.			
OBJECTIVES:	The student will be able:			
	1. To construct and use an astrolobe.		pp. 81-83, 604	
	2. To develop the concept of the celestial sphere.	pp. 346-347	pp. 85-87	8C 190 E "Charting the Universe With Optical and Radio Telescopes" (I.M.C.)
	3. To focus a telescope on stars and planets. (optional)			
SUGGESTED TIME IN WEEKS:	0.75			

		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.1	A perspective of the position and motion of the Earth in space is gained by celestial observation and measurements.			
SUB CONCEPT:	4. Matter is clustered and more in some parts of the universe. (a) The largest local clusters of matter are galaxies.			
OBJECTIVES:	The student will be able:			
	1. To state the characteristics of galaxies.		pp. 34-48	
	2. To group galaxies according to their shape.	p. 413	pp. 40-45, 595, 596	
	3. To describe the Earth's place in the Universe.	pp. 407-410	pp. 41, 44-45	
SUGGESTED TIME IN WEEKS:	1.0			

		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.1	A perspective of the position and motion of the Earth in space is gained by celestial observation and measurements.			
SUB CONCEPT:	4. Matter is clustered more densely in some parts of the universe. (b) Stars and other celestial bodies can be classified and grouped.			
OBJECTIVES:	The student will be able:			
	1. To categorize stars as: supergiants, giants and white dwarfs.	pp. 395-396	pp. 19-23	
	2. To familiarize him/herself with the H-R diagram.	p. 395	pp. 19-22	
SUGGESTED TIME IN WEEKS:	0.25			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.2	Various theories attempt to explain the origin of the solar system and universe.			
SUB CONCEPT:	1. Man's religions offer an explanation of the Earth's origins.			
OBJECTIVES:	The student will be able: 1. To present the biblical view of the Earth's origin. 2. To analyze the biblical view of the Earth's origin.	SEE EDMONTON CATHOLIC SCHOOLS GRADE 7 RELIGION PROGRAM, pp. 268-277 OR Link, Mark. THESE STONES WILL SHOUT. A NEW VOICE FOR THE OLD TESTAMENT. pp. 8-41 Argus Communications, Niles, Illinois.		
SUGGESTED TIME IN WEEKS:	0.50			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.2	Various theories attempt to explain the origin of the solar system and the universe.			
SUB CONCEPT:	2. Science views the origins in terms of observable processes. (a) Big-Bang Theory is widely held as a possible explanation.			
OBJECTIVES:	The student will be able:			
	1. To state the Big-Bang Theory.	pp. 419-423	p. 57	
	2. To perform a simple experiment in order to simulate the expanding Universe.	p. 421	p. 57	
	3. To explain the basic idea associated with the Big-Bang Theory.	p. 422	p. 57	
SUGGESTED TIME IN WEEKS:	0.50			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT 8.2	Various theories attempt to explain the origin of the solar system and the universe.			
SUB CONCEPT:	2. Science views the origins in terms of observable processes. (b) Many others hold that the Steady-State Theory is more acceptable.			
OBJECTIVES	The student will be able:			
	1. To state the Steady-State Theory.	p. 422	p. 58	
	2. To explain the basic idea associated with the Steady-State Theory.	p. 422	p. 58	
SUGGESTED TIME IN WEEKS:	0.25			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.2	Various theories attempt to explain the origin of the solar system and the universe.			
SUB CONCEPT:	2. Science views the origins in terms of observable processes. (c) Solar System origins can be explained in other ways.			
OBJECTIVES:	The student will be able:			
	1. To state the Oscillating or Pulsating Theory.		p. 57	
	2. To explain the basic idea associated with the Oscillating or Pulsating Theory		p. 57	
SUGGESTED TIME IN WEEKS:	0.25			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.3	The sun is a typical star.			
SUB CONCEPT:	1. Much of what we surmise about the stars comes from our observations of the sun. (a) Radiation from the sun can be used to investigate its structure, motions, history and processes.			
OBJECTIVES:	The student will be able:			
	1. To measure the size of the sun.		p. 107	8C 494 E "Space Science: The Sun AS a Star" (I.M.C.)
	2. To identify sun spots.		p. 107	
	3. To explain the formation of the corona, and the solar wind.		pp. 109-110	
	4. To explain the formation of solar prominences.	p. 366	p. 110	
	5. To explain why the sun emits heat (simple qualitative treatment)	pp. 361-363		F 1268 Our Mister Sun (Faculty of Extension, U. of A.)
SUGGESTED TIME IN WEEKS:	0.75			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.3	The Sun is a typical star.			
SUB CONCEPT:	1. Much of what we surmise about the stars comes from our observations of the sun. (b) Solar radiation is both beneficial and harmful to life on its planets.			
OBJECTIVES:	The students will be able: 1. To define radiation. 2. To list some of the beneficial and harmful effects of solar radiation, e.g., sunburns, tans, cancer of the skin. 3. To deduce that much dangerous radiation is filtered by the atmosphere.	p. 256, 259	p. 6, 49-52	
SUGGESTED TIME IN WEEKS:	0.50			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.4	Solar gravity and planetary inertia maintain a system of planets in orbit.			
SUB CONCEPT:	1. Planetary motion is predictable. 2. The members of this solar system differ in their physical characteristics and dynamic properties. - several planets have satellites of their own.			
OBJECTIVES:	1. To name the planets in our solar system.	p. 336	pp. 98, 608	8C 283 E How He Explore Space. (I.M.C.)
	2. To name the order of the planets from the sun.		pp. 96-97	
	3. To list three characteristics of the planets other than earth.	pp. 336-345	pp. 110-116	
SUGGESTED TIME IN WEEKS:	0.75			

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		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.4	Solar gravity and planetary inertia maintain a system of planets in orbit.			
SUB-CONCEPT:	3. The moon provides an opportunity to study an extra terrestrial body. (a) The Earth and Moon interact. (b) The Moon's environment is different from the Earth's.			
OBJECTIVES:	The student will be able: 1. To describe four characteristic features of the Moon.	pp. 136-137		
	2. To describe the phases of the moon as it relates to its orbit.	This may be considered review. See Objectives for Concept 8.1 sub concept 2, page 2.		8C 542 E Earth-An interplanetary Perspective (I.M.C.) Ocean Tides - Bay of Fundy 8C 216-E
SUGGESTED TIME IN WEEKS: 0.25		pp. 316-318	pp. 141-142	

		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.5	The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.			
SUB CONCEPT:	1. Air is matter. (a) Air is a mixture of gases.		.....	
OBJECTIVES:	The student will be able: 1. To determine the percentage of oxygen in the air. 2. To state the names and the percentage composition of the main gases in the atmosphere near the Earth. 3. To recognize that the gaseous components of the atmosphere changes in kind and concentration as distance from the Earth's surface increases.		pp. 174-175 pp. 176-179 pp. 171-172	
SUGGESTED TIME IN WEEKS:	0.50			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.5	The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.			
SUB CONCEPT:	1. Air is matter. (b) Air has weight and exerts pressure which can be measured.			
OBJECTIVES:	The student will be able: 1. To demonstrate that air has weight. 2. To demonstrate that air exerts pressure. 3. To state the pressure of air at sea level. 4. To read a simple aneroid barometer.			
SUGGESTED TIME IN WEEKS:	0.5			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.5	The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.			
SUB CONCEPT:	2. The atmosphere is heated by the Sun's energy which is absorbed by the Earth. (a) Radiant energy from the sun is transformed into sensible and latent heat. Much of the incoming heat is absorbed by the Earth and its oceans.			
OBJECTIVES:	The student will be able to: 1. To explain the "greenhouse effect" and the heating of the Earth's atmosphere using knowledge of radiation wavelength.	p. 264-265		
SUGGESTED TIME IN WEEKS:	0.25			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.5	The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.			
SUB CONCEPT:	2. The atmosphere is heated by the sun's energy which is absorbed by the Earth. (b) Heat absorption by the Earth varies. -Light colored areas reflect more heat than dark areas. -Oceanic areas reflect more heat than continental areas. -The altitude of the sun above the horizon affects the heat absorbed.			
OBJECTIVES:	The student will be able: 1. To apply the knowledge that light colors reflect more heat than dark areas. 2. To describe the evidence that water reflects more light than land. 3. To explain variation in temperature and seasonal changes.		pp. 192-195	
SUGGESTED TIME IN WEEKS:	0.75			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.5	The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.			
SUB CONCEPT:	2. The atmosphere is heated by the sun's energy which is absorbed by the Earth. (c) Absorbed heat is distributed by a number of mechanisms. -Radiation is a means by which a warm body loses heat. -Convection currents distribute heat quickly and efficiently. -The distribution of heat is also achieved by conduction. -Heat loss equals heat gained on a global scale.			
OBJECTIVES:	The student will be able: 1. To give examples when the Earth's heat is transferred by radiation, convection and conduction.		p. 190, 192, 198, 200	
SUGGESTED TIME IN WEEKS:	0.50			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: B.5	The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.			
SUB CONCEPT:	3. The air of the atmosphere is in constant motion due to unequal heating and the rotation of the Earth. (a) There is a pattern to the planetary winds.			
OBJECTIVES:	The student will be able:			
	1. To demonstrate that rotation will cause a deflection in the path of a moving (object) air.	p. 237	p. 207-208	BC 459E "Atmosphere in Motion" (I.M.C.)
	2. To apply the knowledge of heat processes to explain wind formation.	p. 272	p. 206	BC 90E "Above the Horizon" (I.M.C.)
	3. To name and locate the major wind belts of the Earth.	p. 272-276	p. 206-207	Solar Radiation Earth & Sun Pt.1 Faculty of Extension, U of A Unchained Goodness Faculty of Extension, U of A
SUGGESTED TIME IN WEEKS:	0.75			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.5	The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.			
SUB CONCEPT:	3. The air of the atmosphere is in constant motion due to unequal heating and the rotation of the Earth. (b) Local winds are affected by land forms and bodies of water.			
OBJECTIVES:	The student will be able: 1. To describe the formation of land, sea, valley and night time breezes.			8C 145E "What Makes the Wind Blow?" (I.M.C.)
SUGGESTED TIME IN WEEKS:	0.50			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.5	The surface of the Earth and its inhabitants are surrounded by an atmosphere of air.			
SUB CONCEPT:	4. Water vapor is an important constituent of air. (a) Water vapor enters the atmosphere by evaporation.			
OBJECTIVES:	The student will be able: 1. To explain the terms evaporation, condensation, saturation, dewpoint, precipitation and relative humidity. 2. To inter-relate temperature to above. 3. To demonstrate that evaporation is a cooling process which effects the dry bulb of a hygrometer. 4. To use a relative humidity table.		p. 202, 203	8C 505 E "What Makes Rain" (I.M.C.)
SUGGESTED TIME IN WEEKS:	2.0			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.6	Local conditions in the atmosphere are referred to as weather.			
SUB CONCEPT:	1. Different air masses exist within the atmosphere.			
	(a) Fronts form at the boundary between different air masses.			
	-Fronts can be classified. -Changes in weather are often associated with fronts. -Violent storms are often associated with fronts.			
OBJECTIVES:	The student will be able:*			
	1. To describe the four main types of fronts.	p. 279-280	p. 218, 230-233	
	2. To associate fronts with cloud types.			
	3. To relate changes in weather to frontal formation.			
SUGGESTED TIME IN WEEKS:	0.75			

*It is suggested that objectives on pages 50-52 be taught before instruction is given in the following

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.6	Local conditions in the atmosphere are referred to as weather.			
SUB CONCEPT:	1. Different air masses exist within the atmosphere. (b) High pressure areas often serve to define the extent of air masses.			
OBJECTIVES:	The student will be able: 1. To state that winds in a high pressure area swirl clockwise. 2. To recognize that high pressure areas often define the extent of air masses.		p. 207	Is the Weather Changing 8C-537-E
SUGGESTED TIME IN WEEKS:	0.25			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.6	Local conditions in the atmosphere are referred to as weather.			
SUB CONCEPT:	1. Different air masses exist within the atmosphere. (c) Low pressure areas usually form in association with fronts.			
OBJECTIVES:	The student will be able:			
	1. To state that winds in a low pressure area swirl counterclockwise.		p. 207	
	2. To recognize that low pressure areas usually form in association with fronts.	pp. 279-280		
	3. To recognize that cyclones have several weather zones.		p. 222	
	4. To describe formation of tornadoes, thunderstorms, hurricanes and typhoons.		pp. 233-235	4B 192E "Thunder and Lightning" (I.M.C.)
SUGGESTED TIME IN WEEKS:	1.0			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.6	Local conditions in the atmosphere are referred to as weather.			
SUB CONCEPT:	2. Weather reports give information about local and global atmospheric conditions. (a) The information is gathered by instruments at weather stations and by weather satellites.			
OBJECTIVES:	The student will be able:			
	1. To differentiate between the terms weather and climate.	p. 264	p. 219-220	
	2. To recognize that weather reports are made with information from weather stations, weather balloons and satellites.		p. 221-226	8C 239E "Weather Satellites"
SUGGESTED TIME IN WEEKS:	0.25			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.6	Local conditions in the atmosphere are referred to as weather.			
SUB CONCEPT:	2. Weather reports give information about local and global atmospheric conditions. (b) The information given includes reports of air pressure, air temperature, relative humidity, wind direction and speed, cloud cover and precipitation.			
OBJECTIVES:	The above sub-concept is treated in other places.			
SUGGESTED TIME IN WEEKS:	0.5			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.6	Local conditions in the atmosphere are referred to as weather.			
SUB CONCEPT:	2. Weather reports give information about local and global atmospheric conditions. (c) The weather map is a record of the information gathered and is used to predict future weather.			
OBJECTIVES:	The student will be able: 1. To use a key to read weather maps. 2. To locate fronts on a weather map. 3. To identify wind speed and direction on a weather map. 4. To determine degree of cloudiness on a weather map. 5. To determine highs and lows. 6. To determine atmospheric pressure. 7. To determine amount of precipitation. 8. To identify isotherms and isobars.		 pp. 217-219 pp. 228-230 " " " " " " " " " " " " " " " " " "	 8C 537 E Is the Weather Changing? (I.M.C.) 8C 246E "What Makes Clouds?" (I.M.C.) 8C 505E "What Makes Rain?" (I.M.C.)
SUGGESTED TIME IN WEEKS:	2.0			

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		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.7	The crust of the Earth is formed of rocks.			
SUB CONCEPT:	1. Common minerals are found within the Earth's crust. - Most minerals are made up of elements from a group of only nine naturally occurring elements.			
OBJECTIVES:	The student will be able to: 1. Define the terms: atoms, molecules, elements, compounds and describe their relation to minerals. 2. Identify elements which compose minerals.	p. 27	pp. 591-594	
SUGGESTED TIME IN WEEKS:	0.50			

		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.7	The crust of the Earth is formed of rocks.			
SUB CONCEPT:	2. Rocks are formed from a mineral or a mixture of minerals.			
OBJECTIVES:	The student will be able:			
	1. To describe how crystal, mineral and rock are related.		pp. 247-250	
	2. To make rocks from melted minerals.		p. 249	
	3. To identify rock forming minerals* according to color, hardness, streak, relative density, etc.	pp. 28-34	p. 615	
SUGGESTED TIME IN WEEKS:	1.5			

*relative density is to be treated in a qualitative manner

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.7	The crust of the Earth is formed of rocks.			
SUB CONCEPT:	3. Rocks can be categorized into three main groups. (a) Initially, all rocks were formed by the cooling magna of the Earth. -Texture and mineral content of igneous rocks can be used for identification.			
OBJECTIVES:	The student will be able:			
	1. To define the term igneous.	p. 30	pp. 244-245	
	2. To state that old rocks were initially formed by the cooling magma of the Earth.		p. 248	12C 113 E "Rocks that Originate Underground"
	3. To define the terms batholith, lacolith, stock, neck and dike.	p. 113		4B 47E Volcanoes in Action
	4. To differentiate among igneous rocks according to texture-size of crystals.	p. 45	pp. 249-250	8C 467E "Rocks and Minerals: How We Identify Them?"
SUGGESTED TIME IN WEEKS: 1.0	5. To identify selected igneous rocks by texture and mineral content.			

		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.7	The crust of the Earth is formed of rocks.			
SUB CONCEPT:	3. Rocks can be categorized into three main groups. (b) Erosion and/or deposition form sedimentary rocks. -Grain size and/or mineral content of sedimentary rocks can be used for identification.			
OBJECTIVES:	The student will be able:			
	1. To describe the formation of sedimentary rocks.	pp. 57-58	p. 252	8C 507 E Rocks That form on the Earth's Surface
	2. To define deposition of particles.			
	3. To differentiate between cemented and non-cemented sedimentary rocks.		p. 256	
	4. To identify sedimentary rocks according to origin and particle size.			
SUGGESTED TIME IN WEEKS:	0.75			

		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.7	The crust of the Earth is formed of rocks.			
SUB CONCEPT:	3. Rocks can be classified into three main groups. (c) Metamorphic rocks are reconstituted sedimentary and igneous rocks. -Metamorphic rocks are classified on the basis of their mineral content and structure.			
OBJECTIVES:	The student will be able: 1. To explain the process known as metamorphism. 2. To state that both igneous and sedimentary rocks can become metamorphic. 3. To recognize selected metamorphic rocks that are made from sedimentary rocks. 4. To recognize selected metamorphic rocks that are made from igneous rocks. 5. To describe the processes of the rock cycle.	pp. 89-90	p. 265 pp. 267-270 p. 271	8C 458E How Solid is Rock
SUGGESTED TIME IN WEEKS:	1.0			

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REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is constantly being changed.			
SUB CONCEPT:	1. Landforms are being built up by movements within the crust. (a) Earthquakes are the result of movements of masses of rock. (b) Faulting and folding are the result of large forces in the crust. (c) Volcanism is associated with faulting in the crust.		- - - -	
OBJECTIVES:	The student will be able: *			
	1. To list the various deformations of the Earth's crust. e.g. folds, faults, geosyncline.	pp. 132-136	pp. 493, 496, 304-307, 429-432	VTB 143 "What Moved The Mountains, What Moved the Seas"
SUGGESTED TIME IN WEEKS:	2. To explain the process of mountain building. 0.75	pp. 143-144	pp. 424-425	4B 46E "Mountain Building"

*In teaching these objectives teachers should bear in mind that change can be both destructive and constructive

		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is constantly being changed.			
SUB CONCEPT:	1. Landforms are being built up by movements within the crust. (a) Earthquakes are the result of movements of masses of rock. (b) Faulting and folding are the result of large forces in the crust. (c) Volcanism is associated with faulting in the crust.			
OBJECTIVES: (cont.)	The student will be able:			
	3. To explain the causes of earthquakes and the various effects of earthquakes on the earth's crust.	p. 116	pp. 300-304, 620-621	12C 219 E [illegible]
	4. Define seismology.	p. 117	pp. 311-316	
SUGGESTED TIME IN WEEKS:	0.5			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is constantly being changed.			
SUB CONCEPT:	1. Landforms are being built up by movements within the crust. (a) Earthquakes are the result of movements of masses of rock. (b) Faulting and Folding are the result of large forces in the crust. (c) Volcanism is associated with faulting in the crust.			
OBJECTIVES: (cont.)	The student will be able:			
	5. To explain the causes of volcanoes.			4C 484E "Volancoes Exploring the Restless Earth"
	6. To describe the effects of volcanoes on the Earth's crust.		p. 281-289 . . .	4B 41E "Pompeii and Vesuvius"
	7. To report on methods of predicting volcanic eruptions and earthquakes.		p. 290-294 pp. 311-316	
	8. To report on methods of predicting earthquakes.			
SUGGESTED TIME IN WEEKS:	1.0			

		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is contantly being changed.			
SUB CONCEPT:	2. Weathering weakens rock formations. (a) Mechanical weathering makes small pieces out of large ones.			
OBJECTIVES:	The student will be able: 1. To define the term weathering.	p. 57	p. 334	BC 527 E Treasures of the Earth (I.M.C.)
	2. To list the various weathering agents.		p. 334	Mission to Earth -Part I Physical Geography BC-552-E
	3. To simulate the effect of mechanical weathering.	p. 58	pp. 339-340	
	4. To conclude that mechanical weathering makes small pieces out of large ones.	p. 58	p. 342	Mission to Earth -PartII Life Forms and Resources BC
	5. To describe how formation of soils is related to weathering.	pp. 61-62	pp. 347-352	Mission to Earth -Part III Urban Geography BC-554-E
SUGGESTED TIME IN WEEKS:	1.0			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is constantly being changed.			
SUB CONCEPT:	2. Weathering weakens rock formations. (b) Chemical weathering changes the rock itself.			
OBJECTIVES:	The student will be able:			
	1. To observe the effect of dilute hydrochloric acid on limestone.		p. 343	
	2. To explain the role of water and oxygen chemical weathering.		p. 343	
	3. To conclude that chemical weathering produces two effects, a new material as well as smaller pieces.		p. 347	
SUGGESTED TIME IN WEEKS:	0.75			

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		REFERENCES		
		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is constantly being changed.			
SUB CONCEPT:	3. Erosion changes the landforms. (a) Erosion is caused by running water. (b) Erosion is caused by wind. (c) Erosion is caused by glaciation. (d) Erosion is caused by groundwater. (e) Agents of erosion help lay down sediments.			
OBJECTIVES:	The student will be able:			
	1. To list the agents of erosion, e.g., water, gravity, wind.	pp. 148-154, 167	p. 360, 364, 366	8B-18E Erosion Leveling the Land
	2. To explain the processes of erosion caused by water and glaciers.	pp. 155-164	pp. 360-364, 368	8C-480-E Geological Work of Ice 2nd edition (I.M.C.) 8C-87-E Glaciation
	3. To recognize the evidence of the various agents or erosion.			4C 505 E Glacier on the Move
	4. To explain the formation of a river system.		pp. 384-392	8C-245-E Evidence for the Ice Age (I.M.C.) 4C 185 E River Valley 8C 65 E Canada Landform Regions
SUGGESTED TIME IN WEEKS:	1.25			8C 580E The Rise and Fall of the Great Lakes

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is constantly being changed.			
SUB CONCEPT:	4. Dynamic processes are at work within the Earth. (a) Forces acting on the crust results from the nature of the structure of the Earth.			
OBJECTIVES:	The student will be able: 1. To deduce that science has indirect means of determining the interior composition of the Earth.	pp. 123-127	pp. 448-454, 614	
SUGGESTED TIME IN WEEKS:	0.5			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is constantly being changed.			
SUB CONCEPT:	4. Dynamic processes are at work within the Earth. (a) Forces acting on the crust results from the nature of the structure of the Earth.			
OBJECTIVES: (cont.)	The student will be able: 2. To describe the affects of high temperature on rocks and minerals. 3. To describe the convection cells that occur beneath the crust. 4. To explain the effects of the movements of solid and molten materials on the earth's crust.		p. 439	
SUGGESTED TIME IN WEEKS:	1.0			

REFERENCES

		Heller et al	Jackson et al	Audio Visual
CONCEPT: 8.8	The crust of the Earth is constantly being changed.			
SUB CONCEPT:	4. Dynamic processes are at work within the earth. (b) Theories have been advanced to explain how forces have acted on the present landforms. -Continental drift, plate tectonics and sea floor spreading are theories advanced to explain crusted deformation.			
OBJECTIVES:	The student will be able:			
	1. To list the evidence that supports the theory of continental drift.	pp. 225-231	pp. 433-441	Continental Drift 4C 595-E
	2. To outline the main points of the theory of plate tectonics.		pp. 442-446	
	3. To cite two pieces of evidence that the sea floor is spreading.		p. 439	
SUGGESTED TIME IN WEEKS:	1.0			

ELECTIVE TOPICS

Elective topics are to be chosen from the following list. A minimum of one topic is to be studied.

8.1 Materials from the crust have had an important influence on mankind's daily living.

8.2 Evidence for determining the past history of the Earth comes from a study of the crust.

8.3 Matter in the universe appears to be moving at tremendous veleocities.

8.4 The oceans form a large portion of the Earth's surface.

8.5 A locally developed unit.

NOTE: Outlines for each elective; with the exception of 8.5, are provided in the Curriculum Guide along with a list of references.

General Objectives - Grade 9 Science

(Reprinted from Junior High School Science Program of Studies - Alberta Education 1978)

OBJECTIVES: After participating in the activities and completing the assignments associated with this course, the student should be able to:

9.1 Demonstrate a knowledge of and be able to discuss the identified major concepts and their associated sub-concepts within the context of a study of physical science. These major concepts are:

- 9.1.1 Matter occupies space and has mass.
- 9.1.2 The forms and behavior of matter can be explained by the kinetic molecular theory.
- 9.1.3 The many forms of energy can be transferred from place to place or converted from one form to another, but in each case, the total amount of energy remains constant.
- 9.1.4 Matter and Energy are related and are interchangeable.
- 9.1.5 Energy is responsible for bringing about physical and/or chemical changes in the forms and behavior of matter.

9.2 Demonstrate proficiency in the scientific investigative skills of:

- Problem identification
- Outlining procedures and safe work habits
- Organizing observations and data
- Recording results
- Making inferences which relate to hypotheses
- Predicting future behaviors

9.3 Identify and discuss the development of a major scientific concepts such as the kinetic molecular theory as it was explained by Galileo, Bacon, Thompson, Davy and Maxwell.

9.4 Participate in the routine management of the laboratory program by being responsible for the preparation of materials and equipment prior to and following laboratory periods.

9.5 Investigate scientific factors involved with a technological topic such as the development of alternative sources of energy.

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	1. Fundamental to the process of science is the establishment of standards for making measurements. a) The development of standard units and systems of measurement has taken place slowly.				
OBJECTIVES:	The studnet should be able to:				
	1. List and describe the five common units of early measure.	p. 1-4	p. 9-11	p. 24	
	2. State at least two advantages and two disadvantages of the early units of measure.		p. 9-11	p.25	
	3. State at least two reasons why a standard system of measure is a necessity.		p. 10-11	p. 25	
	4. Define a standard of measure.		p. 27	p. 26	
	5. State the standards of measure for length, mass volume in the metric system.		pp. 11, 14 27-30	p. 26-27	
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	1. Fundamental to the process of science is the establishment of standards for making measurements.				
	b) Good measurement techniques are necessary in order to obtain meaningful data.				
OBJECTIVES:	The students should be able to:				
	1. Determine how many smaller units of measure are the same length of one larger unit of measure in the metric system.	p. 7-8		pp. 27-29	
	2. Select and use units which will most accurately express the linear measure of an object.	p. 12		p. 29	
	3. Distinguish between accuracy and precision in measurement.			p. 29	
	4. State a way in which the precision of a measuring instrument can be increased.			p.30	
	5. State two factors which determine the degree of accuracy in any measurement.	p. 9			
	6. Classify any measurement error as a precision factor, accuracy factor, or both.	p. 10-12			
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	1. Fundamental to the process of science is the establishment of standards for making measurements. c) All measurements are approximate.				
OBJECTIVES:	The student should be able to;				
	1. Estimate the length of common objects in the most appropriate metric unit.			pp. 31–32	
	2. Recognize the need for an actual measurement in order to check estimations.			p. 34	
	3. Measure an object to the nearest 0.1 of a cm, nearest 0.01 of a dm, and nearest 0.001 of a m.	p. 10–12		p. 31	p. 14
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visu...
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	1. Fundamental to the process of science is the establishment of standards for making measurements.				
	d) Relationships existing between measurement data are often more clearly shown and are more easily understood by using graphs.				
OBJECTIVES:	The students should be able to;				
	1. Define the terms variable, independent variable, and dependent variable.			p. 5–7	
	2. Perform a simple experiment on the pendulum using several trials, to collect data involving the independent variables.			p. 10–13	
	3. Graph results of a simple experiment to determine the relationship between the independent and dependent variables.	p. 50–53	p. 17–21		
	4. Interpret tables of data in order to draw inferences.	p. 68–87		p. 7–9	
	5. Show general relationships between variable by using a straight line graph.	p. 54–57			
	6. Make hypotheses (predictions) based on a model.			p. 16–21	
SUGGESTED TIME IN WEEKS:	1.0				

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		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	2. Matter can be measured by determining its linear dimensions, its surface area and its volume.	p. 21–25 p. 28–34			
	a) Length, surface area and volume of regular shaped solids can be directly measured.				
OBJECTIVES:	The student should be able to:				
	1. Convert from one metric unit of length to another.			p. 28	
	2. Convert from one metric unit of area to another.			p. 34–35	
	3. Convert from one metric unit of volume to another.			p. 37–39	
	4. Identify the four units of length found in a metre stick.	p. 7–8	p. 14		
	5. Identify three objects which would represent the metric units of length for mm, cm, dm, m.			p. 40	
	6. Define the metric prefixes deci, centi, milli, kilo, hecto, deca.			p. 32	
	7. Measure the linear dimensions of a rectangular solid, a cylindrical solid, and a cubic solid.	p. 22–28	p. 15–17	p. 41–43	
	8. Calculate the volume of a regular solid by using derived formula.			p. 43	
SUGGESTED TIME IN WEEKS:	1.0				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	2. Matter can be measured by determining its linear dimensions, its surface area and its volume. b) Volume of irregularly shaped solids may be found indirectly by liquid displacement.				
OBJECTIVES:	The student should be able to;				
	1. Demonstrate the proper technique for using a graduate cylinder to measure the volume of a liquid to the nearest whole mL.	p. 26	p. 23–24	p. 41	
	2. Calculate the volume of an irregular solid by liquid displacement.	p. 29–31	p. 26–27	p. 41	
	3. Compare the volumes of a regular solid calculated by formula and by liquid displacement.			p. 41	
	4. State the relationship between the solid measure (cm^3) and the liquid measure (mL).	p. 27–28	p. 30–31	p. -31	
SUGGESTED TIME IN WEEKS:	0.50				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	3. Matter can be measured in terms of its mass and weight. Mass and weight are two different measurements of matter.	p. 18–21			
OBJECTIVES:	The student should be able to:				
	1. Convert from one metric unit of mass to another unit of metric mass.			p. 45–47	
	2. State and support with examples the difference between mass and weight.	p. 16–17	p.44–45 p.64–67	p. 45	
	3. Demonstrate the proper technique for using an equal-arm balance and/or a triple beam balance to measure the mass of a substance to the nearest 0.1 g.	p. 17–20	p. 12–13	p. 49	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	4. Density is a characteristic property of any given sample of matter and is, therefore, useful for identification purposes. a) Molecular arrangement influences density.				
OBJECTIVES:	The student should be able to:				
	1. Deduce that the arrangement or packing of molecules affects the density of that substance.			p. 52-53	
	2. State at least two factors, from a model of matter, that affect the density of a substance in a given volume.			p. 53	
	3. Explain why density can be used to distinguish between two different liquids.				
	4. State two factors which affect the density of a substance.		p. 31-32	p. 54	Archimede's Principle 4B-14E
	5. Calculate density when mass and volume are given.				
	6. Use the equation $D=\frac{M}{V}$ to calculate any one of the three variable given the other two variables.		p. 22-23 37	p. 54-55	

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		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	4. Density is a characteristic property of any given sample of matter and is, therefore, useful for identificiation purposes. a) Molecular arrangement influences density.				
OBJECTIVES:	The student should be able to: (continued from previous page)				
	*7 Recognize that the unit commonly used in measuring density in the lab is $\frac{kg}{cm^3}$ (solids) or $\frac{g}{mL}$ (liquids).		p.31	p. 55	
	8. Explain why the density of a substance is independent of the size of the sample used.			p. 54	
	9. Identify at least two substances by determining their densities and comparing results to a chart of densities of known substances.		p. 32	p. 55-58	
	* the standard unit for measuring density is $\frac{kg}{m^3}$				
SUGGESTED TIME IN WEEKS:	1.0				

		REFERENCES			
		Carter et al	Bi el et al	Andrews et al	Audio-Visual
CONCEPT: 9.1	Matter occupies space and has mass.				
SUB-CONCEPT:	4. Density is a characteristic property of any given sample of matter and is, therefore, useful for identification purposes. b) Differences in the density of materials accounts for floating and sinking bodies.				
OBJECTIVES:	The student should be able to;				
	1. Determine the density of water and one unknown liquid.	p. 62-64		p. 59-60	
	2. Develop a relationship between the density of an object, and whether or not it floats in water.	p. 64		p. 64-65	
	3. Suggest at least one example of the same material that has two or more densities.				
	4. Explain why ice floats on water.				
	5. Explain why a floating object sinks by varying amounts of different liquids.				
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	1. Matter is composed of tiny particle a) Tiny particles of matter are called molecules.				
OBJECTIVES:	The student should be able to:				
	1. State some Greek philosophic theories concerning the structure of matter.	p. 151			Evidence for Molecules & Atoms 8B-16-E
	2. Use observations of the forms of matter to support the particulate theory for the structure of matter.			p. 70-88	
	3. Give a common name to the particles that make up matter.		p. 106	p. 89-92	
SUGGESTED TIME IN WEEKS:	0.75				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	1. Matter is composed of tiny particles.				
	b) Molecules vary in size.				
OBJECTIVES:	The student should be able to:				
	1. Compare solutions, dispersions and suspensions.		p. 136		
	2. Name, describe and give examples of three crystal shapes found in nature.				
	3. Infer that variety in properties of matter is due to varying kinds (sizes and shapes) of molecules.	p. 32		p. 136–137	
	4. Demonstrate that the volume of a solution is not always equal to the sum of its ingredients.				
	5. Infer that differences between the volume of a solution and the sum of its ingredients is due to differences in particle size.			p. 139–141	
SUGGESTED TIME IN WEEKS:	1.0				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	1. Matter is composed of tiny particles.				
	c) Spaces exist between the molecules of matter.				
OBJECTIVES:	The student should be able to:				
	1. Draw diagrams to illustrate the particle structure of gases, liquids and solids.		p. 107		Solids, Liquids, & Gases 4B-204E
	2. Recognize that there are attractive forces between molecules of a substance and that those forces are greater in solids than in liquids or gases.	p. 151-152	p. 142		
	3. Infer from observations of expansion and contraction an explanation of the behaviour of molecules.	p. 186-187	p. 107	p. 94-106	
	4. Infer that there are spaces between molecules of matter that can be filled with molecules of another kind.			p. 100-101 p. 112-123	
	5. Grow crystals from a saturated solution.			p. 126	
SUGGESTED TIME IN WEEKS:	1.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	2. Molecules are in a state of constant motion. a) Brownian movement provides indirect evidence of molecular motion.				
OBJECTIVES:	The student should be able to:				
	1. Use the particle motion theory to explain the vibration of microscopic particles in air or liquid mixtures.			p. 127	
	2. State the name given to evidence for molecular motion in fluids.			p. 127	
	3. Explain that Brownian motion is indirect evidence.			p. 94-127	
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	2. Molecules are in a state of constant motion. b) Molecular motion in solids may be vibrational about a fixed position.				
OBJECTIVES:	The student should be able to:				
	1. State that all solids have two properties in common a) they retain their shape, and; b) they maintain their volume as long as their temperature stays the same.	p. 34	p. 129	p. 70 p. 120	
	2. Infer that in crystalline solids molecules are arranged in an orderly fashion.		p. 107		
	3. State at least two example of indirect evidence for molecular motion in solids.				
SUGGESTED TIME IN WEEKS:	0.75				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	2. Molecules are in a state of constant motion. c) Molecules in liquids may be able to slide or move over one another in random directions.				
OBJECTIVES:	The student should be able to:				
	1. State that substances in a liquid have two properties in common: a) they assume the shape of the container into they are poured and, b) they retain their volume as long as their temperature does not change.	p. 34	p. 129	p. 70	
	2. Use evidence from Brownian movement experiments to infer that the molecules in liquids are in motion.			p. 102	
	3. Infer from the readiness to flow and lack of shape that in liquids, molecules are able to slide and move over one another in random directions.			p. 98	
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	2. Molecules are in a state of constant motion. d) Molecules in gases may have considerable freedom of movement in random directions.				
OBJECTIVES:	The student should be able to:				
	1. State that all gaseous substances assume both shape and volume of their container.	p. 34, 388-390	p. 1129	p. 70	
	2. State that the molecules of a gas spread to fill its container	p. 34, 388 390		p. 70	
	3. Infer from Brownian movement experiments that molecules of air are in constant motion.			p. 95-98	
	4. Draw a diagram to illustrate the movement of gas molecules.				
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	2. Molecules are in a state of constant motion. e) The greater the freedom and rate of movement of molecules of the same kind, the higher their energy content.				
OBJECTIVES:	The student should be able to:				
	1. Infer from observations that as a liquid (water) is changed to a gas (steam) there is a greater freedom and movement of molecules and a higher energy content.			p. 73	
	2. Describe a physical model that demonstrates the relationships between rate of molecular motion and energy content.			see objectives on p. 104.	
	3. To deduce that there is a relationship between molecular motion and heat energy.	p. 388-389			
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	3. Molecular movement is the basis for diffusion. a) Diffusion is slow in solids due to limited molecular motion and their closely packed orderly arrangement.				
OBJECTIVES:	The student should be able to:				
	1. Write an operational definition of diffusion.			p. 95	
	2. Infer that diffusion is slow in solids due to limited molecular motion and their closely packed orderly arrangement.				Diffusion & Osmosis 8C-506-E (I.M.C.) (optional)
	3. State at least two examples of diffusion of solids.				
SUGGESTED TIME IN WEEKS:	0.25				

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		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	3. Molecular movement is the basis for diffusion. b) Diffusion takes place more readily in liquids and gases.				
OBJECTIVES:	The student should be able to:				
	1. Demonstrate diffusion in liquids and gases.			p. 95-98	
	2. Infer that since molecules in liquids and gases possess more energy, diffusion takes place more readily than in solids.	p. 388-390		p. 95-102	
	3. Draw a diagram to illustrate the diffusion of two gases.				
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	3. Molecular movement is the basis for diffusion. c) Rate of diffusion depends on the temperature of the substances.				
OBJECTIVES:	The student should be able to: 1. Demonstrate that higher temperatures increase the rate of diffusion of liquids and diffusion of gases.	p. 388		p. 118-127	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	3. Molecular movement is the basis for diffusion. d) Rate of diffusion depends on the size of the molecules involved.				
OBJECTIVES:	The student should be able to: 1. State that, if given the same amount of energy, smaller particles move at a faster rate than larger ones.			p. 94-103	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behavior of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	3. Molecular movement is the basis for diffusion. e) Dissolving is a form of diffusion.				
OBJECTIVES:	The student should be able to:				
	1. Describe dissolving in terms of molecular motion.		p. 150	p. 141	
	2. Write definitions of solvent and solute.	p. 350		p. 136	
	3. State three ways used to speed up the process of dissolving.			p. 137	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behaviour of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	3. Molecular movement is the basis for diffusion. f) Solutions are formed when molecules of one substance spread out evenly throughout another substance.				
OBJECTIVES:	The student should be able to:				
	1. Explain that in the process of diffusion random motion of molecules results in a flow of matter from a region of high concentration to a region of low concentration.	p. 350-351			
	2. Prepare unsaturated, saturated and supersaturated solutions.	p. 352		p. 139-147	
	3. Describe the characteristics of solutions.				
	4. Name example of solutions of: a) solid in solid b) solid in liquid c) liquid in liquid d) gas in liquid				
SUGGESTED TIME IN WEEKS:	1.5				
	205		203		

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behaviour of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	4. Molecular motion results in evaporation. a) Evaporation involved a change in state from a liquid to a gas.				
OBJECTIVES:	The student should be able to:				
	1. Write a definition of evaporation.	p. 177	p. 116	p. 73, 88 103-104*	
SUGGESTED TIME IN WEEKS:	0.25				

*It is advisable not to perform the ETHER demonstration from a safety standpoint.

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behaviour of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	4. Molecular motion results in evaporation. b) Evaporation occurs as faster moving molecules near the surface escape.				
OBJECTIVES:	The student should be able to:				
	1. Explain that evaporation occurs as faster moving molecules near the surface escape.		p. 116 119–120	p. 103	
	2. Explain how molecules in a liquid gain enough energy to penetrate the surface of the liquid, and enter the gaseous state.				
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behaviour of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	4. Molecular motion results in evaporation. c) Evaporation produces a cooling effect.				
OBJECTIVES:	The student should be able to:				
	1. Demonstrate the cooling effect of evaporation.		p. 116	p. 103	
	2. Explain why evaporation produces a cooling effect.		p. 116		
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behaviour of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	4. Molecular motion results in evaporation. d) Different liquids evaporate at different rates.				
OBJECTIVES:	The student should be able to: 1. Demonstrate that different liquids evaporate at different rates (e.g. water and alcohol).			p. 103	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.2	The forms and behaviour of matter can be explained by the Kinetic Molecular Theory.				
SUB-CONCEPT:	4. Molecular motion results in evaporation. e) Rate of evaporation of a given liquid depends on: -Temperature of the liquid. -Vapor content of the air above. -Movement of air across the liquid surface. -Surface area of the liquid that is in contact with the air.				
OBJECTIVES:	The student should be able to: 1. List four factors affecting the rate of evaporation of a given liquid. 2. Explain how increasing the temperature of the liquid increases the rate of evaporation.		p. 116		
SUGGESTED TIME IN WEEKS:	0.5				
	213				213

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	1. Heat and temperature are related.				
	a) Temperatures may be measured indirectly by utilizing the response of matter to changes in temperature.				
	-An arbitrarily chose standard is necessary in the construction of most temperature scales.				
	-Several temperature scales have been devised: Celsius, Kelvin, Others.				
OBJECTIVES:	The student should be able to:				
	1. Define temperature.	p. 339			
	2. State that as the speed of molecules in a body increases, a body expands.	p. 191	p. 90, 109		
	3. State that the measure of the amount of expansion is an indirect way of measuring temperature.	p. 191			
	4. Describe three types of thermometers including their advantages and uses.			p. 339-378	
	5. Construct a simple thermometer.	p. 186-191	p. 101		
220	6. State freezing and boiling points of water on Celius and Kelvin scales.		p. 86-88	p. 341	
SUGGESTED TIME IN WEEKS:	1.25			221	

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	1. Heat and temperature are related.				
	b) Heat is measured indirectly by the effects it produces.				
	-Heat is measured by observing temperature changes of a known mass of water at a known initial temperature.				
	-Heat is measured in joules.				
OBJECTIVES:	The student should be able to:				
	1. State that all molecules are in motion and therefore all substances contain heat.		p. 106-107	p. 349	
	2. State that the unit of heat is derived from measurement of mass of water and temperature change.	p. 193	p. 94-95, 111	p. 347-350	
	3. Given the mass and temperature change of a sample of water, calculate the amount of heat it gained or lost (in joules).	p. 201		p. 354-356	
SUGGESTED TIME IN WEEKS:	1.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	1. Heat and temperature are related.				
	c) Different substances absorb or release different amounts of heat, even though they have similar masses and undergo similar temperature changes.				
	-The heat capacity of water is greater than that of most other substances.				
	-Substances having high heat capacities are good coolants.				
OBJECTIVES:	The student should be able to:				
	1. Define heat capacity.			p. 355	
	2. State the heat capacity of water.		p. 95, 111	p. 357	
	3. Name the term which represents the numerical value for heat capacity.			p. 355	
	4. Select from data given, the substance having the greater heat capacity.	p. 193-196		p. 357	
SUGGESTED TIME IN WEEKS:	1.0				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	1. Heat and temperature are related.				
	d) When a body at higher temperature is in contact with a body at a lower temperature, heat flows from the first to the second body.				
	-Heat is conserved in that heat lost by one body is gained by the other.				
	-Heat may be transferred by conduction, convection, or radiation.				
OBJECTIVES:	The student should be able to :				
	1. State that heat flows from hotter objects to colder objects.			p. 361, 364, 366, 378	Heat & How We Use It
	2. State that heat is conserved (heat loss=heat gained).			p. 373	
	3. Predict a final temperature when equal quantities of water are mixed.		p. 90-93	p. 356-358	
	4. Calculate the amount of heat energy gained and the amount of heat energy lost when two equal volumes of water at different temperatures are mixed.			p. 359-362	8C-501-E Learning About Heat
	5. In terms of molecular motion, state how heat energy is transmitted by conduction in solids.				
	6. Define and give examples of insulators and conductors.	p. 204	p. 111		

cont'd...

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	1. Heat and temperature are related.				
	d) When a body at higher temperature is in contact with a body at a lower temperature, heat flows from the first to the second body.				
	-Heat is conserved in that heat lost by one body is gained by the other.				
	-Heat may be transferred by conduction, convection, or radiation.				
OBJECTIVES:	The student should be able to: (continued from previous page...)				
	7. State what happens when a temperature differential occurs within a liquid or gas.				
	8. Write a kinetic molecular explanation or thermal conduction in liquids or gases.			p. 345	
	9. Describe or draw an illustration to show the pattern of heat transfer within liquids or gases when convection takes place.				
	10. List and describe some application of the principle of convection.				
	11. Name the process and given examples of heat transfer that does not involve molecular motion.				
SUGGESTED TIME IN WEEKS:	22ɔ 2.0		22ɔ		

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	2. Matter exists in difference states.				
	a) Matter can exist in solid, liquid or gas form. Each state is characterized by definite general properties.		p. 98	p. 70	p. 119
OBJECTIVES:	Refer to objectives under sub-concept 9.2 2b,c,d pages 15, 16, and 17.				
SUGGESTED TIME IN WEEKS:					

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	2. Matter exists in different states. b) The addition or removal of heat causes matter to change state.				
OBJECTIVES:	The student should be able to:				
	1. Perform an experiment on the effects of heating ice.			p. 76	
	2. Graph and interpret the results of objective 1.				
	3. Infer that the reverse to objective 1 would occur on removing heat energy from steam.				
	4. Apply this knowledge of melting and vaporization to everyday situations.		p. 116-119		
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	2. Matter exists in different states. c) As any given pure substance changes state, its properties change, its composition does not.				
OBJECTIVES:	The student should be able to:				
	1. Demonstrate that the density of liquid water changes as the water solidifies.			p. 59	
	2. Explain that the density of liquid water changes as the water becomes a gas.				
	3. Explain that liquid water can be readily recovered from either of its solid or gaseous states.				
	4. State examples of water changing state, without changing its compostion, in everyday situations.			p. 80	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	2. Matter exists in different states.				
	d) Temperature remains constant during a change of state.				
OBJECTIVES:	The student should be able to:				
	1. Interpret a graph on the phase changes of water.		p. 113–115		
	2. Explain that temperature remains constant during a change of state, under slow heating.		p. 113–115	p. 73	
	3. Infer that temperature remains constant during a change of state, under slow removal of heat.		p. 114–115	p. 87–88	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	3. A relationship exists between molecular motion and the volume occupied by matter. a) With few exceptions, the volume of a solid increases as molecular vibrational motion increases.				
OBJECTIVES:	The student should be able to:				
	1. Demonstrate that solids increase in volume as they are heated.	p. 187	p. 107	p. 120	
	2. Explain, using the kinetic molecular theory, how the volume of a solid increases as it is heated.				
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	3. A relationship exists between molecular motion and the volume occupied by matter. b) With the exception of water at temperatures below 4° C, liquids increase in volume as molecular motion increases.				
OBJECTIVES:	The student should be able to:				
	1. Demonstrate that liquids increase in volume as they are heated, with the exception of water at temperatures below 4° C.		p. 109–110	p. 119	
	2. Explain, using the kinetic molecular theory, how the volume of a liquid increases as it is heated.	p. 188		p. 378	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.3	Heat and temperature can be explained in terms of molecular motion.				
SUB-CONCEPT:	3. A relationship exists between molecular motion and the volume occupied by matter.				
	c) All gases, at constant pressure, expand uniformly as molecular motion increases.		p. 142-144	p. 118	
OBJECTIVES:	The student should be able to:				
	1. State that, although every solid and liquid has its own particular rate of expansion, <u>all</u> gases expand at the same rate.	p. 188, 191			
	2. Describe an experiment showing that <u>all</u> gases expand at the same rate.				
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.4	Energy enable work to be done and motion to be changed.				
SUB-CONCEPT:	1. Energy may be described as eith kinetic or potential energy.				
OBJECTIVES:	The student should be able to:				
	1. Define kinetic energy.	p. 111	p. 69		
	2. Give examples of when bodies possess kinetic energy.	p. 111	p. 69		
	3. Define potential energy.				
	4. Give examples when bodies possess potential energy.				
	5. State the factors involved in doing work.	p. 178		p. 310-311	
	6. Deduce that more work done in moving an object, against gravity, results in the possession.	p. 177-179			
	7. Deduce that the greater the speed an object has, the greater the kinetic energy it will have.				
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.4	Energy enable work to be done and motion to be changed.				
SUB-CONCEPT:	2. Energy is present in the universe in several forms: - electrical energy - chemical energy - mechanical energy - heat energy - light energy - nuclear energy - gravitational energy - magnetic energy				
OBJECTIVES:	The student should be able to:				
	1. State example of each of the forms of energy.	p. 179	p. 106, 302 243–244		Learning About Nuclear Energy 8C–503–E
	2. State that a relationship exists between heat energy and light energy.	p. 186 277–285	p. 271, 330–331	p. 344, 345 380	
	3. State that a relationship exists between electrical energy and magnetic energy.	p. 277–285			Learning About Sound 8C–502–E Learning About Light 8C–504–E
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.4	Energy enable work to be done and motion to be changed.				
SUB-CONCEPT:	3. One form of energy may be changed into another.				
OBJECTIVES:	The student should be able to;				
	1. Distinguish between kinetic and potential energy when they occur during a pendulum demonstration.	p. 111-112			
	2. Recognize the change from kinetic to potential energy in a moving pendulum and vice versa.		p. 70		
	3. State the energy transformation which occur in a moving car, or in our bodies, or other examples.	p. 199, 272-273, 291	p. 69-73, 291-293, 246-248		
SUGGESTED TIME IN WEEKS:	0.5				

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		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.5	Matter is composed of atoms and molecules.				
SUB-CONCEPT:	1. Theories and/or models have been developed to assist in understanding atoms. a) All matter is made up of atoms.				
OBJECTIVES:	The student should be able to:				
	1. Describe the historical development of various models of the atom.	p. 321-322	p. 165-167	p. 184	
	2. Define the term atom.	p. 34	p. 165	p. 180	
SUGGESTED TIME IN WEEKS:	0.25				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.5	Matter is composed of atoms and molecules.				
SUB-CONCEPT:	1. Theories and/or models have been developed to assist in understanding atoms.				
	b) The atomic model has an internal structure consisting of protons and neutrons forming a central core or nucleus, and an outer structure of electrons.				
OBJECTIVES:	The student should be able to:				
	1. Draw and label a static model of an atom.		p. 170–176	p. 179–181	
	2. State that atoms differ from each other in their number of electrons, neutrons, and protons.		p. 177–181	p. 181	
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.5	Matter is composed of atoms and molecules.				
SUB-CONCEPT:	1. Theories and/or models have been developed to assist in understanding atoms. c) The various kinds of atoms are called elements.				
OBJECTIVES:	The student should be able to:				
	1. Define the term element.	p. 322	p. 106	p. 171	
	2. Identify several elements from a group of substances.	p. 322-330	p. 183	p. 208	
	3. Identify various characteristics by which elements are grouped in the periodic table.	p. 322-330	p. 191-194	p. 181	
	4. Reproduce diagrams (models) of atoms of similar elements and deduce that similarities are due to to the number of electrons grouped furthest from the nucleus.		p. 185-187		
SUGGESTED TIME IN WEEKS:	1.0				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.5	Matter is composed of atoms and molecules.				
SUB-CONCEPT:	2. A relationship exists between atoms and molecules. Atoms can exist individually or in combination with other atoms of the same or different elements and, therefore, are the building blocks or molecules.				
OBJECTIVES:	The student should be able to:				
	1. Define molecule.			p. 179	
	2. Describe an experiment where two elements combine to form a compound (e.g. iron + oxygen).		p. 229-230 233-234	p. 198	
	3. Describe an experiment where a compound is broken into its elements (e.g. Electrolysis of H_2O).	p. 396-397			
	4. Deduce that on a large scale elements combine to form compounds, and on a microscopic scale atoms combine to form molecules.				Evidence For Molecules and Atoms 8B-16-E Molecules: A First Film 4C-607-E
SUGGESTED TIME IN WEEKS:	1.0				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.5	Matter is composed of atoms and molecules.				
SUB-CONCEPT:	3. A relationship exists among elements, compounds and mixtures.				
OBJECTIVES:	The student should be able to:				
	1. Distinguish between pure substances and mixtures.	p. 330-333			
	2. Suggest methods by which compounds can be separated from mixtures.	p. 333-334		p. 165-166	
	3. Distinguish between elements and compounds.	p. 322	p. 206	p. 171-176	
	4. Identify common elements and compounds by their chemical symbols.	p. 324-325	p. 183 223-227	p. 208	
	5. Distinguish between solutions and other kinds of mixtures.	p. 350-351		p. 149-171	
	6. Explain that certain pure substances (elements) can be identified by their properties.	p. 326-330			
SUGGESTED TIME IN WEEKS:	0.5				

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		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.5	Matter is composed of atoms and molecules.				
SUB-CONCEPT:	4. There is a difference between physical and chemical changes.				
	a) Several examples of physical change are obseravable.				
	-Physical properties of matter is determined by inter-molecular distances and forces.				
	-A change in state represents one of the most common physical changes.				
	-Changes in molecular motion and inter-molecular distances and forces of attraction (adhesion, cohesion) also account for physical changes.				
OBJECTIVES:	The student should be able to:				
	1. Identify four physical properties of common substances: boiling point, melting point, density, specific heat.	p.323	p. 64, 52-68 355		
	2. Distinguish between adhesion and cohesion by citing examples of each.	p. 152-157			
	3. Identify physical changes such as change of state, change of size and mixtures.	p. 323 334-337	p. 73		
	260		261		
SUGGESTED TIME IN WEEKS:	0.5				

		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.5	Matter is composed of atoms and molecules.				
SUB-CONCEPT:	4. There is a difference between physical and chemical changes.				
	b) Several examples of chemical change are observable:				
	-Molecular composition determines the chemical properties of matter.				
	-Most chemical changes require a great deal more energy than do physical changes.				
OBJECTIVES:	The student should be able to:				
	1. Identify situations where a chemcial change is taking place.	p. 338-340	p. 178-180	p. 182	Exploring Matter - Chemical Change 8C-11-E
	2. Identify two substances composed of similar elements and state a distinguishing characteristic of each.				
	3. Identify three chemical properties of common substances: - burning in presence of oxygen - ability to react with oxygen in the air. - ability to react with an acid or base.	p. 390-401 372-376	p. 200, 207-209, 216-220, 232-235		
	4. Define chemical change as a change in the physical properties and composition of a substance.	p.323	p. 200	p. 182	

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		REFERENCES			
		Carter et al	Bickel et al	Andrews et al	Audio-Visual
CONCEPT: 9.5	Matter is composed of atoms and molecules.				
SUB-CONCEPT:	4. There is a difference between physical and chemcial changes.				
	b) Several examples of chemical change are observable:				
	-Molecular composition determines the chemcial properties of matter.				
	-Most chemical changes require a great deal more energy than do physical changes.				
OBJECTIVES:	The student should be able to: (continued from previous page...)				
	5. Compare amounts of heat involved in equal masses of wood burning and ice melting.				
	6. Distinguish between the terms endothermic and exothermic.	p. 323			
SUGGESTED TIME IN WEEKS:	0.5				

ELECTIVE TOPICS

Elective topics are to be chosen from the following list. A minimum of two electives is required. If 9.1 is chosen, it is expected that two parts (minimum) are to be do

9.1 Many forms of energy exist which can be transferred from place to place or converted from one form to another.

a) Work represents a transfer of energy (simple machines).

b) Electrical energy can do work and be changed to other forms of energy.

c) Light energy can do work and be changed to another form of energy.

d) The energy of sound plays a significant role in mankind's daily living.

9.2 Liquid pressure can be used to reduce the force required to move an object.

9.3 Latent heat accounts for the energy required to cause a change in the state of a substance.

9.4 A locally developed unit.

NOTE: Outlines for each elective, with the exception of 9.4 are provided in the Curriculum Guide, Alberta Education.